REMARKS

1. Claims 1-17 are pending, and of those 7-9 and 14-17 stand withdrawn as not being elected in response to a restriction requirement. Claim 1 is independent.

2. Claims 1-6 and 10-13 stand rejected under 35 U.S.C 112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. On page 2 of the Office Action, the Examiner recommends redrafting the claims, and in particular claim 1, to positively recite the steps of the method of applicant's invention, and to otherwise comply with U.S. claim drafting practice.

3. Claims 1-6 and 10-13 stand rejected under 35 U.S.C 103(a) as being unpatentable over U.S. Patent No. 6,221,260 to Chahine et al. in view of "Effect of Shrinking Microbubble on Gas Hydrate Formation", Takahashi et al.

4. Claims 1, 4-6, and 10-13 have been amended. Claim 3 has been cancelled. No new matter has been added.

5. Rejections Under 35 U.S.C. 112, second paragraph

Claims 1-6 and 10-13 stand rejected under 35 U.S.C 112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.

Claims 1, 4-6, and 10-13 have been amended and Applicant submits this rejection is now moot.

6. Rejections Under 35 U.S.C. 103(a) in view of Chahine and Takahashi

Claims 1-6 and 10-13 stand rejected under 35 U.S.C 103(a) as being unpatentable over U.S. Patent No. 6,221,260 to Chahine et al. in view of "Effect of Shrinking Microbubble on Gas Hydrate Formation", Takahashi et al.

Applicant has carefully reviewed the references with particular attention to the passages cited by the Examiner and can find no teaching in Chahine or Takahashi of: "A method for collapsing microbubbles, the microbubbles having a diameter of 50 μm or less and floating in a solution and decreasing gradually in size by natural dissolution of the gas contained in the microbubbles, the method comprising accelerating a speed of microbubble size decrease and disappearance by applying a stimulation to the microbubbles, *wherein a great amount of free radical species are released from a gas-liquid interface by increasing a charge density at the gas-liquid interface of the microbubbles*", as recited in claim 1.

The Examiner states that Chahine teaches a method of producing a microbubble using a swirling fluid cavitating jet and in which a stimulation is provided to cause the rapid collapse of the bubble. The Examiner then states that Chahine is different from claim 1 in that Chahine does not mention whether bubbles of less than 50 μm are produced. Applicant agrees on this point.

The Examiner then states that Takahashi teaches the creation of microbubbles using a swirling fluid microbubble generator to produce microbubbles with a diameter distribution which includes microbubbles having a diameter of 50 μm or less and cites FIGs. 1 and 2 of Takahashi.

Takahashi is concerned with a fundamental property of tiny bubbles can be used in a method of gas hydrate generation. This property is the ability of tiny bubbles to make the conditions of hydrate nucleation milder due to increasing interior gas pressure while decreasing in size under water. The interior gas reacts with the surrounding water under the existence of the nuclei and generates the hydrate particles.

Applicant respectfully submits even though Takahashi generates microbubbles having a diameter of 50 μm or less, that Takahashi is not concerned with accelerating the speed of microbubble collapse and therefore does not teach or suggest: "the microbubbles having a diameter of 50 μm or less and floating in a solution and decreasing gradually in size by natural dissolution of the gas contained in the microbubbles, the method comprising *accelerating a speed of microbubble size decrease and disappearance by applying a stimulation to the microbubbles"*, as recited in claim 1.

Further, as is evident in FIG. 1, Takahashi teaches introducting a gas (Xe) into the chamber to create the microbubbles.

By contrast, Chahine is concerned with a technique belonging to the well-known hydrodynamic cavitation technology. In the hydrodynamic cavitation technology described in "Chahine", tiny bubbles are generated by the phenomenon of boiling caused by a reduction of pressure due to a hydrodynamic mechanism. When pressure returns to the origin, these bubbles spontaneously collapse because the bubble interior gas characteristically consists primarily of liquid vapor. In Chahine the liquid vapor in the bubbles is a condensable gas and the volume of the bubbles rapidly decrease upon a phase change from the gas (liquid vapor) back to the liquid. One common liquid taught by Chahine is water, with the gas in the bubbles being water vapor. Thus, the Chahine is concerned with bubbles that have a condensable interior gas that undergoes and can undergo a phase change from gas to the surrounding liquid when collapsing.

By contrast the microbubbles in Takahashi are of a different gas (Xe) than the liquid (distilled water in Takahashi FIG. 1). Thus, the microbubbles in Takahashi have an interior gas that is not condensable and an interior gas that cannot undergo a phase change to the surrounding liquid when collapsing.

Thus, Applicant submits that it would not be obvious to a person skilled in the art to combine the techniques taught in Chahine to the microbubbles of Takahashi.

Also Applicant submits that there is no teaching in Takahashi or in Chahine of "the microbubbles having a diameter of 50 μm or less … *wherein a great amount of free radical species are released from a gas-liquid interface by increasing a charge density at the gas-liquid interface of the microbubbles*", as recited in claim 1.

Therefore, Applicant submits that Chahine and Takahashi taken singly or in combination do not teach, suggest, motivate or make obvious claim 1 and thus claim 1 is patentable in view of Chahine and Takahashi.

Dependent Claims

Claims 2, 4-6 and 10-13 depend on claim 1. "If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious." *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Therefore, in light of the above discussion, Applicant submits that claims 2, 4-6 and 10-13 are also allowable at least by virtue of their dependency on nonobvious claims as well as the additional limitations recited by each of these claims.

In view of the above, Applicant submits that the application is now in condition for allowance and respectfully urges the Examiner to pass this case to issue.

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The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to deposit account no. 12-0415. In particular, if this response is not timely filed, the Commissioner is authorized to treat this response as including a petition to extend the time period pursuant to 37 CFR 1.136(a) requesting an extension of time of the number of months necessary to make this response timely filed and the petition fee due in connection therewith may be charged to deposit account no. 12-0415.

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